hard German silver can be best employed to fit the curves of bones. Those used for fractures of small bones like the radius, ulna, clavicle, and fibula are drilled to the 5 Gauge which allows the passage of a screw that will perforate both compact layers, a matter of vital importance since a screw obviously cannot get a secure hold on a single compact layer. To illustrate this I have chosen Fig. 8 which represents an ununited fracture of nearly three months' standing rather than a recent fracture, since the difficulties to be encountered are much greater in the former than in the latter. The injury was sustained on Feb. 22nd, 1906, and came under the care of a surgeon who has devoted much attention to the mode of production of fractures. I mention this fact to show that the patient had the advantage of the best treatment possible at the time of the injury. Manipulation was effected under an anæsthetic and plaster-of-Paris was employed for fixation. A useful arm was promised in about six weeks. On May 17th, we exposed the fragments, removed their ends, and effected accurate apposition by screws and plates. The patient has now a perfectly useful arm. Fig. 9 represents the fragments united by means of the plates and screws.

Fig. 10 represents a more or less vertical fracture of the lower end of the femur into the knee-joint in which the condyles were separated by a considerable interval. Fig. 11 shows the condition after operation.

Virgin silver appears to afford one of the best wire media should such be required. Staples with prominent or rounded angles are often very efficient in conditions suitable to their use, as in the case of the upper end of the humerus and the lower end of the femur. I know no condition in which pegs can be of any use mechanically.

Cavendish-square, W.

THE OPSONIC INDEX TO VARIOUS ORGANISMS IN THE SANE AND INSANE,

WITH THE RESULTS PRODUCED BY INJECTING TUBERCULIN.[1]

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THE recent observations of Wright and others on the opsonic power of human blood serum to the tubercle bacillus and other organisms and the methods they have discovered of estimating this power have opened up a new field for research and provided new methods of treatment for bacterial diseases which have already produced beneficial results. As Wright[2] found that in cases of staphylococcal and tuberculous infection with an entire absence of clinical symptoms there was a diminished phagocytic power to these organisms as compared with that of healthy individuals, and as this power could be increased by injections of the corresponding vaccine, he concluded that the lowered phagocytic power permitted infection to occur and that the resistance to infection by any organism could be estimated by calculating the opsonic power of the blood serum. The results of observations recorded by Bulloch and others agree with those obtained by Wright and support his view, as all have found a lowered opsonic power in cases of localised tubercular and staphylococcal infection, and these are the cases which benefit most from vaccine injections. Low tuberculo-opsonic indices have also been found in cases of early phthisis "cured" by sanatorium treatment. These cases frequently relapse, however, and whether the low opsonic index is the cause or the result of infection is not definitely decided. The estimation of the opsonic index of a class of healthy patients with a decided liability to tuberculous infection is therefore an important point in estimating the value of a low index as an indication of the resistive power of the individual to infection.

The statistics of the death-rate from tubercular disease, particularly phthisis, occurring in asylums leave no room for doubt that the insane as a class are specially liable to tuberculous infection. In their last report the English Commissioners in Lunacy compare the death-rates in institutions for the insane with those of the general population, all deaths under the age of 15 years being excluded. The death-rate of the general population per 1000 from phthisis was for males 2·07 and for females 1·35, while in the insane population it was 16·0 and 14·6 for each sex respectively. The Scottish Commissioners in their report for 1905 refer to the same subject and quote figures which are equally striking. In the six district asylums showing the lowest death-rate from tuberculous disease, of which Perth district asylum is one, the average per 1000 patients resident was 11, while in the counties from which these asylums draw their patients the average per 1000 persons living between the ages of 20 and 60 years was 2·8. Clouston says that in asylums consumption is between three and four times more common than in the general population at the same ages, and the figures quoted above more than support his statement. Even although a certain amount of the difference in the death-rates might be accounted for by overcrowding or other unfavourable conditions in some asylums or by the greater number of post-mortem examinations, and more complete and accurate returns made by institutions, or by the great difference in the totals from which the averages are estimated, still the fact remains that the insane are more susceptible to tuberculosis than ordinary individuals.

I have made observations on the opsonic indices of six members of the staff of Perth District Asylum and also on 30 patients suffering from various forms of mental disease. All were at the time of observation free from active tuberculous disease but five of the patients examined showed evidences of having at one time suffered from such infection. Of these cases one had cicatrices in the neck, while the others showed signs of former lung mischief. Two of them were suffering from general paralysis, one of whom has since died, and only a few small cicatrices at the apex of one lung were found post mortem. The usual technique for the estimation of the opsonic index was employed, equal quantities of serum, leucocytes, and bacterial suspension being used. The blood for examination was taken at the same hour each day and five consecutive observations were made in each case. Koch's new tuberculin T.R. was then injected and daily observations were made for a further period. My own leucocytes were used throughout and my blood serum was used as control. Its opsonic power was fairly constant, the number of bacteria ingested showing little variation from day to day. For the estimation of the tuberculo-opsonic index the contents of 80 leucocytes were usually counted and in no case were less than 50 enumerated. Simultaneous observations were made on the opsonic power of various cases to the bacillus coli communis, staphylococcus aureus, and micrococcus rheumaticus. These observations were continued after the injection of tuberculin T.R. The contents of 50 leucocytes were usually counted for these observations, but on a few occasions only 30 were examined. The same number was examined in each case on the same day.

The average tuberculo-index of the six healthy control cases for five consecutive days was 1·07, the average for each case being 0·98, 0·97, 1·32, 1·06, 1·01, and 1·11, showing a variation between 0·97 and 1·32. This average index agrees with the results obtained by other observers in healthy persons. Urwick,[3] in 20 cases, found the average index to be 1 006, while Bulloch[4] in 84 cases found an index of 0·96, and in Lawson and Stewart's[5] 25 cases the average was 1. The total variation, 0·35, is less than that found by Bulloch in the 84 cases he examined. Urwick states that there is little variation in the index of a healthy person from day to day. I found considerable daily variation in some cases, though the observations were made as far as possible under the same conditions. The greatest amount of variation recorded between any two consecutive observations was 0·3. In one control case, however, a record so low as 0·68 was obtained on one occasion.

The average tuberculo-opsonic index of the 30 insane persons examined for five days was 0·88. The variation was between 0·65 and 1·23 and the daily fluctuation was greater than in the healthy control cases. Of these 30 cases the six with the highest indices gave an average of 1·07, which is exactly that found in the same number of control cases. Although a greater number of insane were examined it may be fairly concluded that the average tuberculo-opsonic index of the non-tubercular insane is below that of the healthy sane. The average of the five patients with evidences of old tubercular disease was the same as that found for all the 30 cases.

[1] Extract from a thesis for the degree of M.D. Edinburgh University.
[2] THE LANCET, Dec. 2nd, 1905, p. 1593.
[3] Brit. Med. Jour, July 22nd, 1905.
[4] London Hospital Gazette, vol. xi, March, 1905.
[5] THE LANCET, Dec. 9th, 1905, p. 1679.

The difference between the index found in the control cases, 1·07, and that found in the insane patients, 0·88, is very marked. This observation is therefore strong evidence in favour of the view that the opsonic power of the blood serum can be used as a test of the liability to tuberculous infection.

An examination of the indices obtained in the various classes of patients gives corroborative evidence. The index obtained in four cases of general paralysis was 0·79. As a class general paralytics are peculiarly liable to tuberculous infection. Mickle states that of all such cases examined post mortem 26 per cent. exhibited caseation or cavities, 12 per cent. arrested phthisis, and 65 per cent. pleuritic adhesions. Two of the four cases observed showed evidence of old lung trouble, but the index of the two cases with no signs or symptoms of previous infection was only 0·78, so that their liability to tuberculous disease may be due to their low resistive power as indicated by the opsonic index. Seven of the patients examined were suffering from acute mental disease. Three of these were cases of adolescent insanity, a class of patient particularly liable to tuberculosis. Their average index was 0·84. Of the remaining four cases two suffered from melancholia and two from mania. The index of the former was 0·88, of the latter 0·91, and as patients suffering from maniacal excitement are less prone to contract tuberculous infection than those suffering from melancholia this observation also supports Wright's view.

The chronically insane are generally believed to be more liable to tuberculous infection than the more acute cases. In 11 chronic cases of secondary dementia the average index was 0·93, while that of seven acute cases was only 0·87. This would seem to indicate that the acutely insane have a lower resistive power than the chronic demented cases, but it is also possible that the latter may become infected during the period of acute onset of the mental disease.

To estimate still further if there was any difference between the sane and insane in their reaction to tubercle I injected the six control cases, all members of the asylum staff, and the 30 patients with Koch's new tuberculin T.R.

In estimating the effect of the injection of any drug or vaccine it is necessary to take into consideration the idiosyncrasy of the individual to the particular drug or vaccine used. With a vaccine injection the idiosyncrasy of the person injected may be taken to represent the liability to infection by the particular organism from which the vaccine is made. In persons suffering from bacterial infection the injection of a vaccine of the infecting organism is followed by a negative phase or fall in the opsonic power of the blood serum and if the dose used be large enough a temperature reaction and constitutional symptoms may be produced. The negative phase is followed by a rise in opsonic power, or positive phase, which lasts a variable time but ultimately the opsonic power falls back to the level at which it stood prior to injection.

Wright[6] has stated that the result of his observations seem to suggest that the development of a negative phase following a dose of T.R. smaller than that which would produce this result in a healthy person may prove to be an index of tubercular infection. He found that the negative phase supervenes upon a very much smaller dose and persists much longer in the case when the patient is the subject of extensive infection than in the contrary case. Lawson and Stewart[7] injected four healthy persons with tuberculin T.R., the dose not being stated, and produced no negative phase. They therefore concluded "that the appearance of a negative phase after inoculation with a small quantity of tuberculin T.R. should enable one to distinguish between the blood of a subject of tubercular invasion and that of a person in sound health." The production of a negative phase after injection is therefore very important from a diagnostic point of view. So far no exact definition of the term negative phase has been made. As I found considerable variation in the opsonic index from day to day and, especially in the insane, that a slight rise sometimes occurred at the first observation made 18 hours after injection, I take a negative phase to mean any fall in the opsonic index occurring within 48 hours after injection, the index being below the level noted at the time of injection and also below the average level for the five preceding days.

Four control cases were injected with $\frac{1}{500}$th of a milligramme of tuberculin T.R. In two a distinct negative phase resulted. The fall in both was immediate and lasted in the one case two days and in the other three days, reaching 0·59 and 0·63 respectively. The subsequent rise was rapid, reaching 1·57 in the first and 1·74 in the second case on the sixth day after injection, a point in both cases much higher than any previously reached. In the one case where there was a tuberculous family history the average index prior to inoculation was 0·98 and the amount of variation considerable. The injection was given at a point well above the average level. In the other the average index was 1·32, but was 1·28 on the day of injection. In the remaining two cases no negative phase was developed. Both were injected at a point below the average level and the succeeding indices were low. As the results obtained did not agree with those recorded by Lawson and Stewart I concluded that the dose used was too large. The remaining two cases were therefore injected with $\frac{1}{750}$th of a milligramme of tuberclin T.R. and with this dose no negative phase was produced. An immediate rise in opsonic power followed the injection, the maximum being reached at the first subsequent observation. The average index of these two cases was 1·01 and 1·11, and they rose to 1·25 and 1·38 respectively. Both were injected at a point slightly above their average level.

Twelve patients were injected with $\frac{1}{5000}$th of a milligramme of tuberculin T.R. and in eleven of these a negative phase occurred. In four cases there was a slight initial rise after injection, followed however by a decided fall, which was complete in all four cases on the third day. In six of the cases a lower level was recorded than that reached in either of the two control cases in which a negative phase occurred. In only two of the insane patients did the maximum of the positive phase reach the level attained by the lower of the two control cases. As a rule, the positive reaction was slower and less pronounced in the insane than in the members of the staff, and also in the acute than in the more chronic cases of mental disease. There was no marked peculiarity in the reaction of two of the cases who showed evidence of old tuberculosis.

The marked difference in the percentage of negative phases following injection in the control cases and insane patients, the lower level reached during the negative phase, and the delayed and less pronounced positive phase in the latter class seem to indicate that the resistive power of the insane to tuberculous infection is less than that possessed by sane healthy individuals.

Eighteen patients received an injection of $\frac{1}{750}$th of a milligramme of tuberculin T.R. and only four showed a negative phase—that is, 22·2 per cent., compared with 91 per cent. of those injected with $\frac{1}{500}$th of a milligramme of tuberculin T.R. As the average index before injection in those to whom the larger dose was administered was 0·87, while in those who received the smaller dose it was 0·89, the greater percentage of negative phases in the former class must be due to the larger quantity injected. All the patients injected with $\frac{1}{750}$th of a milligramme of tuberculin T.R. were suffering from subacute or chronic mental disease, but the greater percentage of negative phases produced with the larger dose in both the control and insane cases indicates that $\frac{1}{500}$th of a milligramme of tuberculin T.R. is too large a dose to use for diagnostic purposes, and the high percentage following injection with $\frac{1}{750}$th of a milligramme of tuberculin T.R. would seem to show that a still smaller dose ought to be employed. Only one of the four cases in whom a negative phase occurred—a general paralytic—showed evidences of old infection. The average index of the four prior to injection was 0·99, but the daily variation in these cases was greater than in the 14 in whom no such reaction was produced.

The chief difference noted between the two control cases and the 14 insane patients in whom no negative phase followed inoculation with $\frac{1}{750}$th of a milligramme of tuberculin T.R. was the slower reaction of the latter after injection. Both control cases reached their maximum on the day following injection, while the insane took an average of four days to reach their positive maximum, but there was little difference in the level ultimately reached, though the average index before injection was lower in the insane.

Wright[8] has shown that a fresh injection of tuberculin during the negative phase produced by a previous injection

[6] Proceedings of the Royal Society, 1904, vol. lxxiv.
[7] THE LANCET, Dec. 9th, 1905, p. 1679.
[8] THE LANCET, Dec. 2nd, 1905, p. 1598.

emphasises the negative phase. I have been unable to trace any connexion between the level of the tuberculo-opsonic index on the day of injection and the subsequent presence or absence of a negative phase. It would appear that in non-tuberculous persons the amount injected has a more important bearing on the result produced than the level of the opsonic index on the day of injection. In all cases where a negative phase was recorded there had been greater irregularity in the opsonic power from day to day previous to injection than in those cases where no such result was observed.

Observations on the opsonic indices to other organisms.—The opsonic power of the serum of five control cases and a number of insane patients was estimated to the bacillus coli communis, staphylococcus aureus, and micrococcus rheumaticus, as well as to the tubercle bacillus. Johnstone and Goodall[9] found agglutinins to various strains of the bacillus colic communis in the blood of 60 per cent. of insane cases examined by them. This form of infection is common in such patients and in cases of cystitis in the asylum I have found this, or an allied organism, present in the urine. Boils and skin irritations are common amongst the insane and a staphylococcus aureus may be isolated from many such cases. The strain used during these observations was obtained from the bone marrow of a case of acute mania who died in a typhoid condition. Rheumatism in its various forms is possibly the most common ailment in the district from which the patients were drawn and although this disease does not appear to be more common in the asylum than in the surrounding district I used the micrococcus rheumaticus as a third type of common infective agents.

So far as could be ascertained none of the individuals examined were suffering from any form of illness while under examination and all carious teeth and other sources of infection were removed before any observations were made.

In the control cases the tuberculo-opsonic index was 1·08. To bacillus coli the average index for five days was 1·02, to staphylococcus aureus 1·1, and to micrococcus rheumaticus 1·07. There would therefore appear to be little difference in the average index of healthy individuals to these various organisms. The amount of variation between the average indices of each individual to the separate organisms was greatest to staphylococcus aureus and least to bacillus coli.

To bacillus coli the average index of 12 patients was 1·06. This result compares favourably with that found in the control cases but the amount of variation was greater. The tuberculo-opsonic index of the same patients was 0·97. In 15 cases tested to staphylococcus aureus the index was 1·07. In the same cases the average tuberculo-opsonic index was only 0·9. 11 cases were observed to micrococcus rheumaticus; the index obtained to this organism was 0·94, while to tubercle in the same cases it was 0·91. There is therefore little difference between the average index of the control and insane cases to these three organisms.

With the exception of bacillus coli the average opsonic index of the control cases was higher to all the organisms employed than that of the insane. The amount of variation was less in the control cases except to staphylococcus aureus. The tuberculo-opsonic index of the insane is lower than the index found to any of the other organisms in the same series of cases and the amount of variations to tubercle is greater. These observations would indicate that the insane are more liable to organismal infection than the sane, and that they have a lower resistive power to tubercle than to any other of the organisms employed.

All four control cases injected with $\frac{1}{500}$th of a milligramme of tuberculin T.R. showed a subsequent negative phase to staphylococcus aureus. Three gave a similar reaction to bacillus coli and two to micrococcus rheumaticus. Of the two cases who gave no negative phase to tubercle, one had a fall in opsonic power to all three organisms, while the other gave a similar result with bacillus coli and staphylococcus aureus. Two of these cases developed a negative phase to tubercle. One of them reacted in the same way to all the three organisms, while the other only did so to staphylococcus aureus. Of the 12 series of observations made to organisms other than the tubercle bacillus after the injection of tuberculin, in nine a negative phase resulted, that is in 75 per cent. The fifth control case was injected with $\frac{1}{750}$th of a milligramme of tuberculin T.R. No negative phase to tubercle was produced, but there was a fall in opsonic power to micrococcus rheumaticus.

Nine patients injected with $\frac{1}{500}$th of a milligramme of tuberculin T.R. were tested to bacillus coli after injection and in all a negative phase resulted. All 12 cases injected with this dose of tuberculin T.R. were tested to staphylococcus aureus and in eight a negative phase followed, that is in 66·6 per cent. Of eight cases examined to micrococcus rheumaticus, five gave a negative phase, that is 62·5 per cent. A series of 29 observations was made on the insane patients to the three organisms after injecting tuberculin and in 22 cases negative phases were produced, that is in 75·86 per cent. On comparing the results obtained in the control and insane cases to these organisms it is seen that as there was little difference in their average indices before injection so the total percentage of negative phases produced is very similar in the two classes. The percentage of cases where a negative phase was observed was less in the control than in the insane cases to bacillus coli and micrococcus rheumaticus, but greater in the control cases to staphylococcus aureus, and this was the only organism in which the variation in the indices before injection was greater in the control cases than in the insane.

Three patients were injected with $\frac{1}{750}$th of a milligramme of tuberculin T.R. and afterwards tested to the other organisms. One of them gave a negative phase to tubercle only. Two gave no negative phase to tubercle, but one of them showed this reaction to all the other organisms while the other did so to bacillus coli. Of the nine observations made to the organisms now under consideration four showed a negative phase, while in the one control case similarly tested after being injected with the same dose of tuberculin the only negative phase recorded was to micrococcus rheumaticus. There is therefore a larger proportion of negative phases produced in the insane with this dose also.

A comparison of the results obtained in the different classes of cases to all the organisms, before and after injecting tuberculin, shows that there is a difference in the resistive power to organismal invasion between them. The tuberculo-opsonic index of five control cases before injection was 1·08, to bacillus coli it was 1·02, to staphylococcus aureus 1·1, and to micrococcus rheumaticus 1·07, giving an aggregate average of 1·06. Of the cases of acute mental disease examined to two or more organisms the index to tubercle was 0·87, to bacillus coli 0·96, to staphylococcus aureus 1·01, and to micrococcus rheumaticus 0·9, the aggregate average being 0·93. The more chronic cases similarly examined showed an average index to tubercle of 0·93, to bacillus coli 1·06, to staphylococcus aureus 1·12, and to micrococcus rheumaticus 0·96, while the aggregate average was 1·01. The index recorded to each organism for the acute cases is therefore below that of the control cases and also of the more chronic patients. The index of the chronic cases is below that of the control cases to tubercle and micrococcus rheumaticus but slightly above the control index to bacillus coli and staphylococcus aureus, but the control aggregate is higher. As no acute case was injected with $\frac{1}{750}$th of a milligramme of tuberculin T.R. a comparison of the different results after injection can only be made on those who received $\frac{1}{500}$th of a milligramme of tuberculin T.R. With this dose the percentage of negative phases recorded in the control cases to all the organisms was 68·7. In the acute cases it was 80·9 and in the chronic cases 80. The percentage is seen to be highest in the acute cases and lowest in the control cases. This result corresponds with that obtained by comparing the average indices before injection and would seem to show that the resistive power of the insane to organismal infection is less than that possessed by the sane and that the more chronic are less liable to infection than the more acute cases.

Five chronic cases tested to all four organisms were injected with $\frac{1}{500}$th of a milligramme of tuberculin T.R. and a negative phase resulted in 80 per cent. Three similar cases received an injection of $\frac{1}{750}$th of a milligramme of tuberculin T.R., and in 41·6 per cent. of the subsequent observations a negative phase was noted. A very slight reduction of the dose injected has therefore a marked effect on the number of negative phases produced.

The demonstration of the specificity of the opsonic body in the blood serum is necessary to support the view that the production of a negative phase after the injection of a minute dose of tuberculin is diagnostic of infection by the

[9] Brit. Med. Jour., Oct. 3rd, 1903.

tubercle bacillus. Bulloch has shown by experiments that the opsonic body is largely specific. I found that with a dose of $\frac{1}{500}$th of a milligramme of tuberculin T.R. even in absolutely healthy individuals a fall of opsonic power to other organisms than the tubercle bacillus was produced. In one control case injected with $\frac{1}{750}$th of a milligramme of tuberculin T.R., though there was a rise in opsonic power to tubercle, there was a fall to the micrococcus rheumaticus after injection. Both these doses are therefore too large for diagnostic purposes.

The absence of local and constitutional symptoms after the injection of tuberculin was very marked. There was no local irritation and beyond a slight feeling of stiffness in the flank at the site of inoculation no inconvenience was caused, and all continued to perform their usual duties. In two control cases there was a slight increase of pulse-rate. In one it was 92 per minute on the evening after injection, while in the other it was 102 on the second evening. There was no rise of temperature, however.

The temperature chart of the insane frequently shows greater irregularity than that of healthy individuals, but the temperature and pulse-rate of the patients injected with $\frac{1}{500}$th of a milligramme of tuberculin T.R. showed no greater variation after injection than had occurred in the same cases during the preceding week.

In all 20 persons were injected with $\frac{1}{750}$th of a milligramme of tuberculin T.R. and in only three did any alteration in temperature or pulse-rate occur. Two were general paralytics. In one the temperature recorded on the second day was 99° F., while in the other the pulse-rate was 94, but the temperature was not affected, and though this patient showed evidences of old lung disease no negative phase was recorded. Such changes in temperature and pulse-rate frequently occur in general paralytics and were therefore not necessarily due to the administration of tuberculin. In the third case the temperature rose to 99·2° on the evening after injection. Such doses of tuberculin T.R. can therefore be administered to non-tuberculous persons with perfect safety.

No mental effect was produced by $\frac{1}{750}$th of a milligramme of tuberculin T.R. and though all the acute cases were inoculated with the larger dose the mental symptoms resulting were neither definite nor lasting.

Conclusions.—Some important general conclusions may be drawn from the results obtained. 1. As the insane are particularly liable to tuberculous infection a comparison of the average indices recorded in the sane and insane and also in the various classes of insane patients would indicate that the opsonic power of the blood serum can be used as a measure of liability to infection and that a low opsonic index precedes infection. 2. The injection of a small dose of tuberculin T.R. in healthy persons produces no negative phase to the tubercle bacillus and therefore may be used as a method of diagnosis. A smaller dose of tuberculin will, however, produce a negative phase in a predisposed person than in one less liable to tuberculous infection. 3. To determine the value of a negative phase after injection the daily variation in opsonic power as well as its level at the time of injection must be estimated. For this reason a number of consecutive observations are necessary; a single, or a number of isolated observations is not sufficient. 4. The average opsonic indices of healthy individuals varies little to different organisms. 5. The injection of a large dose of tuberculin even in healthy individuals causes a fall in opsonic power to other organisms than the tubercle bacillus. This explains the liability of tuberculous cases to secondary infection. For purposes of differential diagnosis by the production of a negative phase a very small dose must be administered. 6. Large doses of tuberculin can be injected into healthy persons without producing constitutional symptoms. Amount of dose may therefore be a matter of diagnostic significance as a small dose causes a reaction in infected cases.

I am greatly indebted to the members of the asylum staff and especially to Dr. L. C. Bruce, the medical superintendent of the Perth District Asylum, for the encouragment and facilities afforded me while engaged in this work.

Montrose.

CITY OF LONDON HOSPITAL FOR DISEASES OF THE CHEST, VICTORIA PARK.—The festival dinner in aid of the funds of the above hospital will be held on Tuesday, June 4th, at the Trocadéro Restaurant, Piccadilly Circus, W., at 7.30 P.M. The Right Honourable the Lord Mayor of London will preside.

ON THE CLINICAL ASPECTS OF METASTASES TO THE CENTRAL NERVOUS SYSTEM AND OTHER PARTS IN MALIGNANT DISEASE OF THE VISCERA.

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IN one of his articles on "The Medical Aspects of Carcinoma of the Breast" Professor W. Osler states that "in many cases of internal metastases in cancer of the breast the symptoms are obscure or there are features which make the diagnosis doubtful." In illustration of this general proposition Professor Osler quotes a number of case records which show that the clinical difficulties created by such metastases arise from a variety of causes. In some cases the primary growth in the breast fails, on account of its small size, to attract attention, or it possesses features which conceal its true nature. In others, though the breast tumour has been recognised and removed, so long an interval has elapsed before the clinical evidences of internal metastases display themselves, that their real significance and relationship are overlooked. And in a third group, while one or other of the positions just defined may also exist, the symptoms caused by the metastases are so purely subjective that an interpretation of them as merely functional disturbances is readily adopted. This last-mentioned position seems to be reached in connexion more particularly with the development of secondary malignant tumours in the spinal canal, and situated so as to involve either the spinal cord itself or the posterior roots of the spinal nerves. Pains in the back and side, often indefinite and ill-defined as to position, and sometimes becoming of agonising severity, "may persist for months," says Professor Osler, "without any sign of organic disease"; and even throughout the course of the illness—a period possibly of two years, or even longer—there may be no disturbance of either motion or sensation. In short, the diagnosis of metastases secondary to carcinoma of the breast may be missed, from non-recognition of the original tumour, from delay in the occurrence of the metastases, or from restriction of the clinical evidences to the subjective sensations of the patient.

It is now proposed to describe briefly some clinical experiences which show that what is true, as stated above, of carcinoma of the breast and its secondary developments applies equally to carcinoma of the viscera and the metastases which may result therefrom. In one direction, at least so far as the non-recognition of the primary growth is concerned, this statement has no unfamiliar sound. Thus, it needs but a moderate acquaintance with the facts of clinical medicine to learn of cases of secondary cancer of the liver in which neither the history nor the physical examination gives any hint of the site, or indeed of the existence, of a primary malignant process. It happens that the clinical facts and associations of the secondary growths in such cases are often very conspicuous and free from ambiguity. Further, experiences of this order are relatively frequent events. Hence, here, not only are the results of the metastatic process usually recognised easily but custom removes the surprise which might otherwise be expressed at the absence of all evidences of a primary tumour. It is not unimportant to illustrate the proposition that a very similar order of events may be noted when the primary disease takes origin in organs other than the alimentary canal—such, for example, as the lung, the pleura, or the bladder—and when the secondary growths appear not in the liver but in the central nervous system, the bones, or other parts. Primary malignant disease of the lung or bladder, as is shown in cases recorded in this article, is by no means always in its clinical aspect an urgent and distinctive process, and the symptoms resulting therefrom may fail altogether to suggest the serious conditions on which they, as a matter of fact, depend. Hence secondary or metastatic developments in such cases may readily fail to secure an accurate and ready interpretation, and if, as may be the case, the symptoms arising from such developments are entirely subjective in character, it is hardly surprising to find that they are apt to